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Effectiveness of public health practices against shaken baby syndrome/abusive head trauma in Japan

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ABSTRACT

Objectives: Previous studies have demonstrated the effectiveness of educational materials on infant crying to change caregivers' knowledge and behaviours related to shaken baby syndrome or abusive head trauma (SBS/AHT) using selected samples in randomized controlled trials. This study investigated the impact of public health practices to prevent SBS/AHT in Japan through the use of educational materials.

Study design: Cross-sectional study.

Methods: The intervention was comprised of two parts: (1) the screening of an educational DVD at a prenatal class; and (2) the distribution of a public health pamphlet at a postnatal home visit. Expectant parents watched a DVD (*The Period of PURPLE Crying*) about the features of infant crying and recommended behaviours (walking away if frustrated in the event of unsoothable crying, sharing information on crying with other caregivers) at a preterm parenting class held at eight months' gestation. A postnatal home-visit service was implemented in which a maternity nurse distributed a pamphlet to explain information about infant crying. Before the four-month health check-up, a self-administered questionnaire was distributed to assess exposure to these public health practices and outcome variables (i.e. infant crying knowledge, walk-away and information-sharing behaviours), and responses were collected at the four-month health check-up ($n = 1316$). The impacts of these interventions on outcome variables were analysed by comparing those exposed to both interventions, either intervention and neither intervention after adjusting for covariates.

Results: Crying and shaking knowledge were significantly higher among women exposed to the public health practices, with a dose-response relationship (both $P < 0.001$). Further, walk-away behaviour during periods of unsoothable crying was higher among the intervention group. However, sharing information about infant crying with other caregivers was less likely among the intervention group.

Conclusions: The impact of educational materials in public health practice on knowledge of crying and shaking, and walk-away behaviour in Japan had a dose-response relationship; however, an increase in sharing information with other caregivers was not observed.

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Introduction

Shaken baby syndrome or abusive head trauma (SBS/AHT) is the primary cause of death due to abuse in infants.¹ SBS/AHT is triggered by infant crying and is caused by the caregiver shaking the infant violently, with or without striking the infant against a hard surface. This can lead to serious head injuries such as subdural haematomas, diffuse axonal injury and retinal haemorrhage.

In Western countries, inflicted traumatic brain injury has an estimated rate of around 30 cases per 100,000 infants aged <12 months.^{2,3} Although the prevalence rate of admitted SBS/AHT cases in Japan is unknown, it is estimated to be similar to rates in Western countries because the prevalence of shaking is similar: 2.6% for children <2 years old in North Carolina, USA,⁴ 3.4% for infants aged six months in the Netherlands,⁵ and 3.4% for infants aged four months in Japan.⁶ The mortality rate ranges from 10% to 30%,^{7–11} which is higher than that for *Haemophilus influenzae* type b meningitis (approximately 5%).¹² Significant neurological impairments are observed in at least 50% of SBS/AHT survivors.¹³ The estimated cost of SBS/AHT is enormous; medical and long-term management costs have been reported to exceed \$300,000 and \$1,000,000 per case, respectively.¹⁴ Effective interventions for preventing SBS/AHT are required to save the lives of children and costs to society.

A previous hospital-based study demonstrated the effectiveness of parental educational programmes on the dangers of shaking, which reduced the incidence of SBS/AHT by 47%.¹⁵ A new educational programme, *The Period of PURPLE Crying*,¹⁶ was recently developed based on evidence which showed that infant crying is a common stimulus of shaking.^{15,17–19} The programme defines different aspects of infant crying, and features key recommendations for caregivers about how to manage a crying infant.

The letters that make up the acronym 'PURPLE' stand for the following aspects of infant crying: the peak pattern of crying (P), unexpected crying (U), crying that is resistant to soothing (R), the infant's pained expression when crying (P), long-lasting cries (L), and evening clustering of crying (E). The PURPLE programme outlines three 'action steps' for managing a crying infant: (1) use the 'carry, comfort, walk and talk' approach to calm the baby; (2) if the crying intensifies or becomes too frustrating, the caregiver is encouraged to walk away, then return to check on the baby; and (3) never shake or hurt the baby. The PURPLE programme also describes SBS and its risks to the infant, and emphasizes the need for caregivers to share information from *The Period of PURPLE Crying* with other caregivers, including how to manage frustration, the dangers of shaking a baby, and action steps to manage infant crying.

The PURPLE programme has demonstrated consistent effectiveness including increased knowledge of crying and recommended behaviours for preventing SBS/AHT (e.g. walking away during unsoothable crying, sharing information with other caregivers) in randomized controlled trials (RCTs) in Seattle, USA,²⁰ Vancouver, Canada²¹ and Greater Tokyo, Japan.²² However, the effectiveness of this educational programme demonstrated by these RCTs may not be generalizable to other settings due to selection bias. Therefore, the

effectiveness of these educational materials in public health practice in a general population must be confirmed.

Other educational materials to prevent SBS/AHT have been developed. These include the Take 5 Safety Plan for Crying, which focuses on beliefs about infant crying in New Haven, USA²³; a short and simple educational intervention introduced shortly after childbirth in France²⁴; and an educational programme for maternity nurses that incorporates a leaflet, video and signed statement for parents that acknowledges receipt of information in New York, USA.²⁵ These programmes were also implemented in hospitals; however, few studies focused on them as a public health strategy. As part of a public health campaign to prevent SBS/AHT in Ontario, Canada, a three-pronged approach was used including in-hospital education, a home-visit programme and a media campaign. This revealed that 6% of caregivers required education on infant crying during home visits.²⁶ Further, a short animation entitled 'Crying Baby/Shaking Your Baby is Just Not the Deal', featuring strategies on how to respond to a crying infant, has been used in health promotion campaigns in Australia,²⁷ but empirical evidence of its effectiveness has not been reported clearly.

In Japan, due to an increase in reported child abuse and maltreatment cases,²⁸ several maternal-child health policies addressing child maltreatment have been implemented at the municipal level, such as prenatal parental classes, the Home-Visit Service for Newborns (a home-visit service by public health nurses during the first month of life) and the Home-Visit Project for all Infants (a home-visit service by trained community staff before four months of age). For example, the municipal government of Kamagaya City in Chiba, Japan, has provided parental classes for primiparous parents and interested parents, the Home Visit Service for Newborns for expectant parents, and the Home Visit Project for all Infants classes for all new mothers. Using these opportunities, the authors assessed the effectiveness of using educational materials about infant crying and management in public health practice to prevent SBS/AHT. It was hypothesized that caregivers who received prenatal parental classes or postnatal home visits would increase their knowledge and change their behaviours related to SBS/AHT compared with caregivers who were not exposed to these interventions, and effectiveness would be strongest among those who received both interventions. As public health practice in Japan promotes the provision of equal health services for all residents, an RCT was not a suitable design for this study; instead, an observational study design was used.

This study investigated the impact of newly developed public health practices to prevent SBS/AHT using educational materials on infant crying to increase knowledge and change behaviours related to SBS/AHT in Japan.

Methods

Sample

The target subjects were mothers ($n = 1594$) with infants aged four months between June 2010 and January 2012 (i.e. they were invited for the four-month health check-up during this period) in Kamagaya City, Chiba Prefecture. Kamagaya City is

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